California Integrated Waste Management Board

March 2007

Contractor's Report

To The Board

California Electronic Waste Recycling Act

ANALYSIS OF 2005 NET COST REPORTS

Produced Under Contract by:

Humboldt State University Sponsored Programs Foundation and R.W. Beck, Inc.

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Background

Under the California Electronics Recycling Act, all approved collectors and recyclers were required to submit an annual net cost report to the California Integrated Waste Management Board (the Board) by March 1, 2006, covering the first year of the program coinciding with calendar year 2005. This report analyzes the net cost reports received during the program's first year, with the purpose of assisting the Board in administering the program, including its need to ensure fund solvency and periodically consider changes to the standard payment rates. Net cost reports covering 2006 are due by March 1, 2007, and will be analyzed in a similar report by summer 2007. Future net cost report requirements are subject to Board determination. The net cost reporting system, including standard forms, a Guide, a recorded videoconference training session, and other materials are available on the Board's web site at: http://www.ciwmb.ca.gov/Electronics/Act2003/Recovery/Net Cost/Default.htm.

Methodology

The research team analyzed a representative sample of reports (see Table ES-1) by reviewing and confirming them through discussions with submitting organizations. The review focused on ensuring that data were entered in submitted reports accurately and consistently, and that the study team's interpretation of data was correct. The review did not constitute a formal audit, and generally supporting documentation beyond the submitted report was not reviewed.

Table ES-1
Summary of Sample of Reports Analyzed

Item	Analyzed Sample	Percent of 2005 Totals
Number of Collector Reports	29	11%
Number of Dual Entity Reports[1]	20	71%
Total Recovered Pounds CEW in Analyzed Reports	43,100,991	66%
Total Recycled Pounds CEW in Analyzed Reports	44,716,438	69%

1) Dual entity reports cover both recovery and recycling, so a total of 49 reports covering recovery activities were included in the study sample.

The team determined that the analysis of the selected entities' reports reflects the range of costs experienced by participating organizations. Notwithstanding that, the accuracy of the analysis is dependent upon the completeness and accuracy of the self-reported data and information included in the reports, and both submitting organizations and the research team learned valuable lessons during this first program year that should improve the reliability of future net cost studies.

Analysis of Reported Net Costs

Figure ES-1 shows the reported net cost per pound for each of the 49 reviewed and confirmed reports for ***recovery*** activities included in the study sample, arranged from lowest to highest. Figure ES-2 shows the reported net cost per pound for the 20 ***recycler*** reports included in the sample. Table ES-2 summarizes net cost estimates derived from the sample. Following the table are several key findings.

Figure ES-1: Recovery Net Costs Included in the Study Sample
($ per Pound)

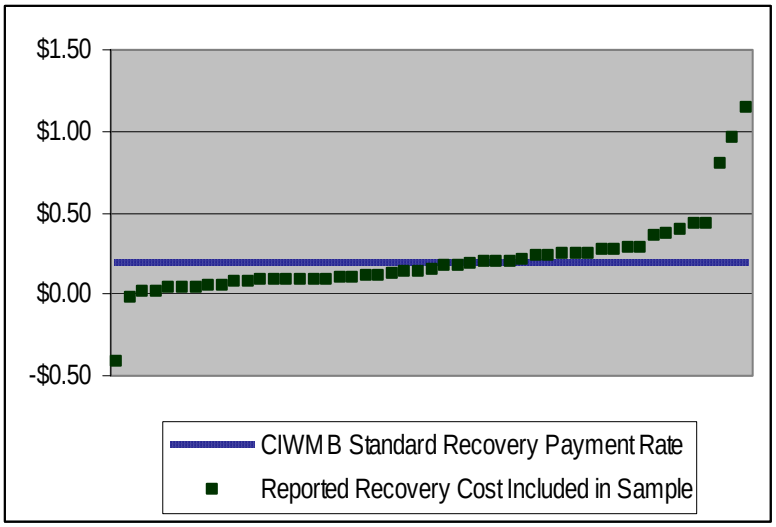


Figure ES-2: Recycling Net Cost Estimates Included in the Study Sample
($ per Pound)

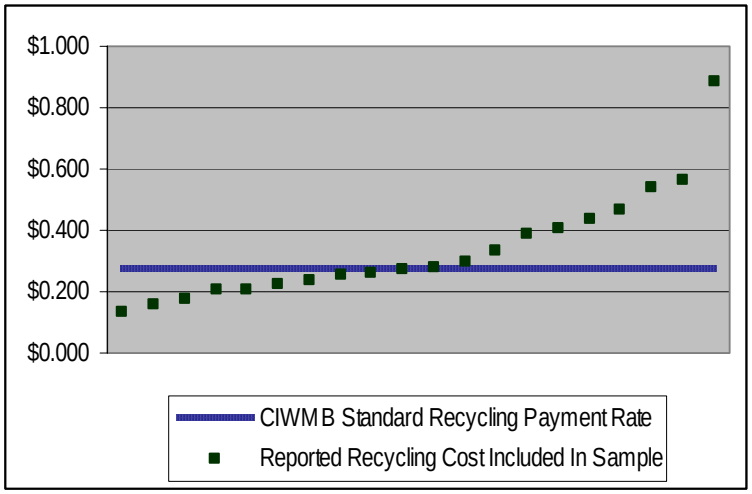


Table ES-2
Summary of Recovery and Recycling Net Cost per Pound Estimates(cents/lb.)

	Item	Weighted Average	Mean	Median	Percentage Lower than Standard Payment Rate
Recovery	Revenue (all sample reports[2])	3.9	3.8	0.0	NA
	Cost	21.0	24.6	17.9	NA
	Net Cost	17.1	20.8	15.3	63%
Recycling	Revenue	5.7	5.5	5.1	NA
	Cost	30.9	39.1	31.8	NA
	Net Cost	25.2	33.6	27.5	50%

Notes:
1) Based on a sample of 49 reviewed and confirmed collector reports and 20 dual entity reports including both recovery and recycling activities.
2) If only the 22 reports listing recovery revenue are considered, the weighted average recovery revenue is 6.7 cents per pound, the mean is 8.5 cents per pound, the median is 8.0 cents per pound and 59% of reports showed recovery net costs greater than the standard payment rate.
3) Net cost equals costs minus revenue. However, due to the nature of the statistics, this formula does not hold exactly for the median column.

Summary of Findings

Finding: Net costs vary widely across reporting organizations.

Different types of organizations and geographic locations experienced significantly different net costs per pound. Reasons for differences in reported costs include different management practices, throughput amount, and market trends such as pricing and competitive pressures. For collectors, key factors include the type of collection program used and the type of customers targeted. In particular, recovery programs targeting non-residential CEW generators appear to be significantly less costly than those targeting residential generators. Based on a limited sample of 12 programs, 42 percent targeted primarily residential generators and had a weighted average net cost of 22.8 cents per pound. In comparison, 37 percent targeted primarily non-residential generators, with a weighted average net cost per pound of 10.9 cents per pound.

For recyclers, key factors include the extent of processing activities and resulting market values obtained for recovered CEW components.

Some organizations reported "outlier" net costs that were either extraordinarily high or low. For example, two collectors in the sample reported negative net costs per pound. In both cases, this was due to relatively low operating costs, combined with relatively high revenues derived from fees charged to CEW generators. (One was a public program charging a per-unit fee for CEW recycling, and the other a private firm charging a fee for broad services to commercial/industrial clients that included CEW pick-up.) The high end of net cost per pound for both collectors and recyclers reflect a combination of one-time start-up costs as well as high cost structures. In some cases, high-cost organizations stated that they have taken steps to alleviate such high cost structures.

Finding: Based on three of four alternative measures, the current standard payment rates (20 cents per pound for recovery and 28 cents per pound for recycling) more than cover typical reported net costs.

The ***weighted average*** (17.1 cents per pound for recovery and 25.2 cents per pound for recycling) reflects the overall program cost, calculated as if the program operated as a single firm (i.e., by dividing the total reported costs by total pounds for all firms in the study sample). By its nature, this measure weighs larger firms more than smaller ones.

The ***mean*** (20.8 cents per pound for recovery and 33.6 cents per pound for recycling) is an average of each firm's reported value. It weighs each organization's reported value equally, regardless of the organization's size. For both recovery and recycling, a small number of firms reported very high values, resulting in a mean that is higher in value than the weighted average.

The ***median*** (15.3 cents per pound for recovery and 27.5 cents per pound for recycling) is the mid-point – half of the study sample had a net cost per pound below this value, and half above.

The ***covered percentage*** (63 percent for recovery and 50 percent for recycling) is the percentage of organizations that had their reported costs covered by the current standard payment rate, based on individual firms' reported net cost, not aggregated average statistics.

Finding: Almost half of collectors in the study sample reported recovery revenue in 2005. If this revenue were excluded from the analysis, a majority of collectors still would have received a positive cash flow for recovery activities based only on CIWMB payment revenue (e.g., net costs would be less than the current standard payment rate).

In most cases the reported recovery revenue that was included in the analysis was derived from service fees charged to generators, and in a few cases it reflects payments from recyclers over-and-above the standard 20 cent- per-pound payment (a growing trend in 2006). The analysis of recovery costs presented excludes the standard 20 cents per pound CIWMB payment entirely. Since the intent of the Act is to provide "free and convenient" collection services, the Board may choose to consider the effects of not "counting" this recovery revenue. If it is excluded, the net cost is equal to the total costs shown in Table ES-2.

Finding: Proposals for a "reasonable rate of profit" vary considerably.

Program regulations allow participants to identify a "reasonable rate of profit or return on investment" in their net cost reports. (Section 186610.10) Profit was excluded from the analysis of net costs presented in this report. However, participants were asked to identify and suggest a "reasonable rate of profit" for the Board's consideration when adjusting payment rates. Thirty-four approved collectors made suggestions that averaged to 15 cents per pound. Additionally, four suggested a profit rate of 20 percent and one suggested a profit rate of 10 percent on total revenues. For comparison, assuming average total revenues of 23.9 cents per pound (the sum of the 20 cent standard recovery payment and the weighted average recovery revenue of 3.9 cents per pound), a 20 percent profit rate equates to 6.0 cents, a 10 percent profit rate equates to 2.7 cents and a 5 percent profit rate equates to 1.3 cents per pound. Fourteen approved recyclers made suggestions that averaged to 11.7 cents per pound. For comparison, assuming average total revenues of 33.7 cents per pound (the sum of the 28 cent standard recovery payment and the weighted average recovery revenue of 5.7 cents per pound), a 20 percent profit rate equates to 8.4 cents, a 10 percent profit rate equates to 3.7 cents and a 5 percent profit rate equates to 1.8 cents per pound.

Trends and Considerations

The following market and industry trends each have implications that may be relevant to the Board's consideration of program adjustments:

- The California electronics recycling industry is growing steadily, in terms of the number of players and total volume handled. For example, between 2005 and 2006 the number of participants increased from just over 300 to well over 500, and the volume handled increased from 65 million pounds to over 124 million pounds.
- The California electronics recycling industry is still young and evolving rapidly; as a result, net costs may be somewhat erratic for the foreseeable future. For example, start-up and expansion of operations, mergers and acquisitions, experimentation with new contracting and supply terms are common and can complicate generalizations about net costs.
- Intense competition among recyclers is driving up prices paid to collectors. While in 2005 this practice was just beginning, with typical pass-through revenues in the 2 to 3 cent- per-pound range, by early 2007 reports of pass-through revenues as high as 10 cents per pound have been documented. Furthermore, some collectors are also beginning to pass through a portion of their standard payment to providers of CEW feedstock.
- Many collectors and recyclers feel compelled by market competition and customer demand to handle other types of electronics waste, in addition to CEW.
- Market demand and prices for recovered CEW components were relatively strong during the first two years of the program, but may become more volatile in coming years.
- Changing technologies for monitors and televisions will ultimately alter the economics of electronics recycling, but the effects of this trend have yet to appreciably affect recovery and recycling of CEW.

Every two years beginning on July 1, 2004, State statute requires the Board, in collaboration with the Department of Toxic Substances Control, to establish a payment schedule "to cover the net cost for an authorized collector to operate a free and convenient system for collecting, consolidating and transporting covered electronic wastes in the state," and to "cover a recycler's net cost to receive, process and recycle a covered electronic device from an authorized collector."[*]

Because costs vary considerably for program participants due to a number of factors (as documented throughout this report), the Board is faced with a dilemma. No matter where the Board sets the payment rate, some organizations costs will be more than covered, and some will be less than covered.

The issues below indicate some different approaches the Board may choose to adopt to address this dilemma when considering potential program adjustments to the standard statewide payment rates:

- What measure should be used to set payment rates? For example, each of the four measures presented in Table ES-2 above could serve as a basis for setting rates, among others.
- Since only some collectors receive service-related fees for CEW, and statute references "free and convenient" collection, how should recovery revenue be considered when setting rates?
- Should the Board adjust recycling payment rates, collector payment rates or both?
- Should the Board establish tiered payment rates for different types of collection and/or recycling operations?

The implications of adjusting payment rates include:

[*] California Public Resources Code, Section 42478-42479.

- Increasing rates may tend to decrease the incentive for achieving greater efficiency. Program participants who receive payments in excess of profit levels they view as acceptable may choose to pass through an increasing portion of state funds to suppliers, and/or allocate a high percentage of the firm management's time and resources, to gain market share, while making increasing efficiency levels a secondary priority.
- Greater payments may further promote expansion of the number of firms involved in the program and the volume handled, along with attendant competitive pressures. Decreasing program payments could have the opposite impact, with volumes potentially decreasing.
- The increased volume combined with increased payment rates could potentially compromise the solvency of the fund. Conversely, reduced payment rates will help to safeguard fund solvency.
- Increasing payment rates means more program participants will have their costs covered, whereas decreasing payment rates means fewer will.
- Increasing payment rates means the gap by which program payments exceed actual costs will increase, whereas decreasing payment rates will have the opposite effect.
- Increasing payment rates may exacerbate the trend toward recyclers and collectors passing through a portion of their standard payments, whereas decreasing rates may reduce this trend.

Section 1
INTRODUCTION

1.1 Background and Purpose

This report analyzes net cost reports covering 2005, that were submitted to the California Integrated Waste Management Board (the Board) by approved collectors and recyclers in Spring 2006, as required under the California Electronic Recycling Act (the Act). The purpose of the report is to assist the Board in administering the program, including its need to ensure fund solvency and to periodically consider potential adjustments to the standard recovery and recycling payments.

The Act is intended to provide "free and convenient" recycling services for *covered electronic wastes* (CEW) designated for inclusion under the program. Currently, CEW includes the following types of products with a viewable screen size greater than four inches:

- Cathode ray tube (CRT) devices (including televisions and computer monitors);
- LCD desktop monitors;
- Laptop computers with LCD displays;
- LCD televisions; and
- Plasma televisions.

Funding for the program is derived from a fee on sale of these products levied at the retail level, in the amount of $6 to $10, depending on screen size.

The Board developed the Covered Electronic Waste Payment System to reimburse approved collectors and recyclers for their net costs, including a reasonable rate of profit. At the program's initiation in January 2005, the standard statewide payment rates were set at 20 cents per pound for recovery and 28 cents per pound for recycling. Payments are made to recyclers, who are required to pass through the standard recovery payment to collectors. Payment requests are made by recyclers through claims submitted to the Board for review and approval. Recyclers receive the entire *Combined Statewide Recovery and Recycling Payment Rate* of 48 cents per pound, and are required to pass through the standard statewide recovery payment to approved collectors. The program involves a variety of documentation and other requirements designed to safeguard against fraud.

All approved collectors and recyclers were required to submit an annual net cost report to the Board by March 1, 2006, and again by March 1, 2007. Each report covers the previous calendar year. Future net cost report requirements will be subject to a Board determination.

The Board is authorized to adjust the retail fee and/or standard statewide recovery and recycling payments, based upon review of net cost reports and other information. To date the Board has only considered such changes once, in summer 2006, and chose to maintain the initial payment rates and retail fees. Board staff anticipates that the payment rates will again be considered in summer 2007. This report, analyzing the first set of net cost reports submitted in spring 2006, which covers the first program year of 2005, is intended to help inform the Board's consideration of changes, along with an analysis of the second set of net cost reports covering 2006, which are due to the Board by March 1, 2007.

Additional information on the program, including links to authorizing legislation and detailed regulations, is available on the Board's Internet web site at http://www.ciwmb.ca.gov/Electronics/Act2003/.

1.2 Report Organization

Following this introduction, Section 2 summarizes the report methodology. Section 3 describes the CEW marketplace during the study year 2005, including a broad description of the approved collectors, recyclers and markets for recovered materials derived from CEWs. Section 4 presents a broad overview of reported net cost per pound estimates, including a description of alternative measures useful for understanding how costs vary. Section 5 provides a more detailed analysis of the reported revenues and costs that underlie the net cost-per-pound estimates. Sections 6 and 7 describe the key factors that influence collectors' and recyclers' net costs, respectively. And finally, Section 7 discusses some trends and issues the Board may wish to take into account while considering potential changes to the program.

Section 2
METHODOLOGY

2.1 Steps in the Analysis

The Board retained the team of Humboldt State University's Office for Economic and Community Development and R.W. Beck, Inc. to develop a reporting system and to analyze net cost reports submitted in the first two reporting years. The reporting system consists of the following three standard forms:

- A one-page net cost report summarizing revenue, costs, pounds handled and the net cost per pound (Form 220);
- A two-page standard worksheet for documenting recovery revenues and costs (Form 220a); and
- A two-page standard worksheet for documenting recycling revenues and costs (Form 220b).

Additionally, the team prepared a *Guide to Net Cost Reporting* to assist collectors and recyclers in using the forms. Two "webinar" training sessions were held prior to the report submission deadline, drawing a total of approximately 100 participants. All of these materials, along with a recording of the training session and a frequently asked questions list, are available online at

http://www.ciwmb.ca.gov/Electronics/Act2003/Recovery/Net Cost/Default.htm.

The basis for this report is a detailed analysis of a sample of net cost reports covering the first year of the program, 2005, which were submitted in spring 2006. The analysis of net cost reports presented in this report involved the following steps:

Step One: Conduct a Preliminary Analysis of All Submitted Reports

The Board provided to the consultant team 308 net cost reports, including 266 reports from approved collectors and 42 reports from dual entities (organizations that are both approved collectors and recyclers under the program). A preliminary analysis indicated that a high percentage of the reports contained apparent errors, including arithmetic, incorrect use of forms and vague or unclear responses. It was determined that the best approach to analyzing the reports would be to select a representative sample for additional review and confirmation. Additionally, the preliminary review resulted in adjustments to the reporting forms intended to simplify and clarify future reports.

Step Two: Select a Representative Sample of Reports to Analyze

The consulting team selected a representative sample of reports for additional review. Initially, the selected sample initially included:

- All dual entity reports;
- The 15 largest collectors; and

- An additional 15 randomly selected collectors.

Several reports were then deleted from the sample, either because they were not active in the reporting year, or because of complications with their reports. The resulting sample analyzed included 49 reports, as summarized in Table 2-1 below. The 20 dual entities' reports analyzed comprise 71 percent of the 28 dual entity reports submitted, reflecting 69 percent of all reported recycling volume. The 29 collectors' reports analyzed constitute 11 percent of the 288 submitted collector reports, reflecting (along with the collection volume from analyzed dual entity reports), 66 percent of all collectors' volume. Moreover, the analyzed organizations include a good mix of large and small volume operators in a mix of rural and urban areas, located in diverse regions of the state. Almost three-quarters of the sample participated in the state payment system for the entire calendar year studied, while the remainder began participation during the year.

Table 2-1
Summary of Sample of Reports Analyzed

Item	Analyzed Sample	Percent of 2005 Totals
Number of Collector Reports	29	11%
Number of Dual Entity Reports[1]	20	71%
Recovery Volume in Analyzed Reports	43,100,991	66%
Recycling Volume in Analyzed Reports	44,716,438	69%

1) Dual-entity reports cover both recovery and recycling, so a total of 49 reports covering recovery activities were included in the study sample.

Step Three: Review and Confirm Selected Reports

Each of the selected reports was reviewed and confirmed through phone, email and fax correspondence with the submitting organization. The confirmation included verification that the report was filled out correctly, and to the extent practical, explanations of any extraordinarily high or low values and other clarifications as needed. The confirmation process did not include on-site review of documentation or "auditing" of reports.

The team also conducted supplementary interviews and requested additional information from selected organizations regarding market trends and the types of collection program services provided and type of processing activities undertaken by recyclers.

Step Four: Data Analysis

Once the selected sample of reports were confirmed, the data were compiled in an electronic spreadsheet file and analyzed, as described in the remainder of this report.

2.2 Level of Confidence in Results

The research team determined that the sample of net cost reports analyzed in this report is representative of the range of organizations participating in the program during the study year of 2005. The study is based on self-reporting by program participants that was not subject to on-site review or audits. Rather, the study team confirmed the consistency and interpretation of information in reports that were included in the study sample via telephone and email correspondence with submitting organizations. The accuracy of the study findings are dependent upon the completeness and accuracy self-reported information included in the study sample, and both submitting organizations and the research team learned valuable lessons during this first program year. Adjustments to the reporting forms were made that will simplify and expedite reporting and analysis of 2006 costs. That, combined with a general maturing of the CEW collection and recycling industry (albeit with continued, rapid evolution) means that the analysis of 2006 net costs will provide an even more up-to-date, complete and accurate picture of net costs.

The selected sample is representative not only of the range of organizations participating in the program, but also of the potential sources of error in accurately describing net costs. These potential sources of error include:

- Most organizations needed to allocate certain line items to CEW handling because their accounting systems capture costs for a broader range of business activities (e.g., handling other types of e-waste along with CEW). This was most typically done via a volume-based allocation applying the percentage of total pounds handled that was CEW to estimate line items such as advertising or general overhead expenses.
- Analysts may have misunderstood what revenues or costs were included in certain line items on submitted net cost reports. For example, it was not always clear whether a missing line item indicates that no costs were incurred, whether the costs were included elsewhere, or whether the submitting organization was simply unable to identify the costs.
- In 2005 many organizations were in a start-up mode. And, even for organizations that had been previously involved with CEW collection or recycling, accounting systems had to be re-vamped to track costs specifically related to covered electronic wastes.
- The California electronics recycling industry is young and is changing rapidly. Cost structures are likely to differ markedly among organizations for some time, as innovation and competition for market share lead to constant adjustments, mergers, acquisitions and partnerships.

Because the analysis of net cost reports did not include on-site review of documentation or audits, no independent verification of the reports was conducted. Rather, reports included in the study sample were confirmed through discussions with submitting organizations to confirm that data were entered correctly and consistently, and that the team's interpretation of entered data was correct.

Section 3
ANALYSIS OF RECOVERY NET COST

3.1 Overview

This section summarizes the analysis of recovery revenues and costs. This overview focuses on net cost-per-pound estimates as reported in the study sample. The following two sections describe recovery revenue and costs, respectively, in more detail. The final sub-section explores the factors that most influence recovery net costs.

Figure 3-1 shows the reported net cost per pound for each of the 49 reviewed and confirmed reports for recovery activities included in the study sample, arranged from lowest to highest. As discussed in Section 2.1 above, this sample comprises 11 percent of all submitted collector reports plus 71 percent of all submitted dual entity reports (which include a section on both recovery and recycling). In all, 66 percent of all CEW handled in 2005 (by weight) is represented in the sample set of reports analyzed.

Figure 3-1 Reported Recovery Net Costs Included in the Study Sample
($ per Pound)

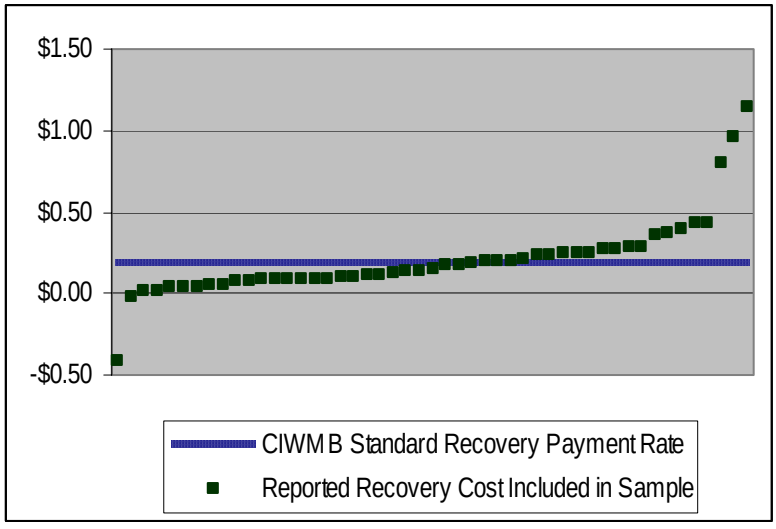


Table 3-1 summarizes the analysis of these 49 reviewed and confirmed recovery net cost reports. The table lists four separate measures that each convey important information useful in understanding how net costs varies. The ***weighted average*** is a measure of overall program-wide performance that weighs each firm according to the total number of pounds of CEW they handle (e.g., firms handling more CEW influence the weighted average more than smaller firms). It is calculated by adding values from all submitted reports, and dividing the sum by the total number of pounds reported. The ***mean*** is the average of each firm's reported value, with all firms considered equally regardless of their size. The ***median*** is the reported value for which half of the sample is above and half is below. Finally, the **"percentage of reports above standard payment rate"** indicates the percentage of reports in the sample that showed a recovery net cost per pound greater than the current standard recovery payment rate of 20 cents per pound based on data they reported.

Table 3-1
Summary of Recovery Net Cost per Pound Estimates

	Item	Weighted Average	Mean	Median	Percentage Lower than Standard Payment Rate
Recovery	Revenue (all reports)	3.9	3.8	0.0	NA
	Cost	21.0	24.6	17.9	NA
	Net Cost	17.1	20.8	15.3	63%

1) Based on a sample of 49 reviewed and confirmed reports.
2) If only the 22 reports listing recovery revenue are considered, the weighted average recovery revenue is 6.7 cents per pound, the mean is 8.5 cents per pound, the median is 8.0 cents per pound and 59% of reports showed recovery net costs greater than the standard payment rate.
3) Net cost equals costs minus revenue. However, due to the nature of the statistics, this formula does not hold exactly for the median column.

3.1.1 Summary of Findings

The following findings are based on the figure and table above.

Finding: Recovery net costs vary widely across reporting organizations.

Different types of organizations reported significantly different net costs per pound. And, a small number of organizations reported "outlier" costs that are substantially lower or higher than most other organizations. Reasons for differences in reported costs include different management practices, different levels of throughput, differences in targeted generator types, types of collection programs and whether revenue was received for collection services or from recyclers (over and above the standard 20 cent payment rate). In addition to these operational differences, some firms experienced higher-than-normal costs due to one-time start-up costs associated with facilities and equipment purchases or modifications. Two collectors analyzed reported negative net costs per pound. In both cases this was due to relatively low operating costs, combined with relatively high revenues derived from fees charged to CEW generators. In one case, the organization was charging fees of between $25 and $35 per unit to generators through most of 2005. The other case involved a private firm providing broad services for a fee to commercial/industrial clients that included CEW recovery. The high end of net cost per pound for both collectors and recyclers reflects a combination of one-time start-up costs for move-in, facility additions, etc., as well as high labor and other cost items. In several cases, the high-cost firms stated that they have taken steps to alleviate such high cost structures. Section 3.4 below discusses the factors that most influence variability of recovery net costs in more detail.

Finding: Estimates of "typical" net costs per pound for recovery vary from 15.3 to 20.8 cents per pound, depending on the measure considered.

Table 3-1 provides three separate measures of "typical" net cost per pound. The weighted average of 17.1 cents per pound reflects the overall program cost, calculated as if the program operated as a single firm (i.e., by dividing the total reported costs by total pounds for all firms in the study sample). By its nature, this measure weighs firms that handled more CEW more than smaller ones. The mean of 20.8 cents per pound is an average of each firm's reported value. It is higher than the weighted average because a small number of firms reported very high values, driving up the overall mean. The median of 15.3 cents per pound is the mid-point – half of the study sample had a net cost per pound below this value, and half above.

Finding: Almost two-thirds of collectors report a net cost per pound below the current standard payment rate.

Based on the study sample, 63 percent of collectors reported a net cost per pound less than the current standard payment rate of 20 cents (e.g., net revenues are greater than the standard payment rate). These include a mix of both small and large organizations. The organizations with net costs above the standard payment rate tend to be relatively smaller firms, as evidenced by the relatively low median and weighted average, compared to a relatively high mean (pushed higher by a small number of very high reported net cost values).

Finding: Almost half of collectors reported recovery revenue in 2005. Excluding this revenue, a majority of collectors still have net costs less than the current standard payment rate.

Twenty-two of the 49 collector reports in the sample listed some type of recovery-related revenue. In most cases, this revenue was derived from service fees charged to generators, and in a few cases, it reflects payments from recyclers over-and-above the standard 20 cent-per-pound payment (a growing trend in 2006). The analysis of recovery costs presented excludes the standard 20 cents per pound CIWMB payment entirely. If recovery revenue were to be excluded from this analysis, the resulting net cost would equal the total costs shown in Table 3-1. The weighted average and mean net cost per pound would be greater than the current standard payment rate. The median would remain lower at 17.9 cents.

Finding: Proposals for a "reasonable rate of profit" for recovery activities vary.

Program regulations allow participants to identify a "reasonable rate of profit or return on investment" in their net cost reports. (Section 186610.10) Profit was excluded from the analysis of net costs presented in this report. However, participants were asked to identify and suggest a "reasonable rate of profit" for the Board's consideration when adjusting payment rates. Thirty-four approved collectors made suggestions that averaged to 15 cents per pound. Additionally, four suggested a profit rate of 20 percent and one suggested a profit rate of 10 percent on total revenues. Assuming average total revenues of 23.9 cents per pound (the sum of the 20 cent standard recovery payment and the weighted average recovery revenue of 3.9 cents per pound), a 20 percent profit rate equates to 6.0 cents, a 10 percent profit rate equates to 2.7 cents and a 5 percent profit rate equates to 1.3 cents per pound.

3.2 Recovery Revenue

As shown in Table 3-1, the weighted average collection revenue reported was 3.9 cents per pound, and varied from 0 to 45.3 cents per pound. In all, 22 of 53 analyzed reports (41 percent) reported receiving revenue for collection services beyond the standard payment. Virtually all of these were related to fees charged to generators for collection services, with an undetermined percent of revenue also derived from payments to collectors from recyclers in excess of the standard 20 cent per pound as required by CIWMB. (In 2005, this trend had just begun and such surplus payments where they occurred were typically on the order of 2 cents per pound. Anecdotally, the trend is intensified in 2006 with some recyclers reportedly paying collectors as much as 10 cents per pound over and above the standard payment.)

Service fees take different forms. While most programs have eliminated specific per-unit fees for recycling CRTs and other covered electronic waste, some continue to charge a fee. In addition, commercial firms specializing in hazardous waste management and asset management may receive fees for collection of a wide range of materials, including but not limited to covered electronic waste. In such cases, firms typically allocated a portion of this collection service revenue to CEW, based on the portion of total electronic waste handled that is estimated to be CEW, by weight. Some government collection programs showed revenue derived from general solid waste management budgets not directly tied to CEW programs. While noted, such revenue was not included in the analysis.

3.3 Recovery Costs

Table 3-2 shows the breakdown of weighted average recovery costs into the three main categories of labor, transportation and other, based on the study sample results. The following three sections describe each cost category in more detail.

Table 3-2
Breakdown of Weighted Average Recovery Costs

Measure	Labor	Transportation	Other	Total
Percent of Total Costs	48%	17%	35%	100%
Cents per Pound	10.0	3.7	7.3	21.0

3.3.1 Recovery Labor Costs

Labor costs comprised about half of all recovery costs, at a weighted average of 10.0 cents per pound. The breakdown between direct and indirect labor costs was nearly even, although it is possible some reports treated indirect labor differently. Some apparently included contract labor as indirect, while others may have treated it as direct. Reasons for differing labor costs include the type of collection program used and the specific on-site management practices employed.

3.3.2 Recovery Transportation Costs

Transportation costs comprised about 17 percent of all recovery costs, or 3.7 cents per pound on a weighted-average basis. Reports broke transportation out into two categories. Transportation from generators to the collection facility averaged 2.3 cents per pound, while transportation from the collection facility to the recycling facility averaged 1.4 cents per pound.

Reasons for differing transportation costs include:

- Different types of collection programs (e.g., drop-off vs. pick-up);
- Whether transportation is handled by the firm or contracted out;
- Transportation arrangements with the recycler (since 2005 a strong trend has apparently emerged for recyclers to pick up transportation costs);
- Whether some transportation costs were included in the "other costs" category (described below);
- Location and distance to shipping destination; and
- Specific transportation vehicles used and the materials shipped.

3.3.3 Recovery "Other" Costs

The "other" category comprised just over one-third of all recovery costs, or about 7.3 cents per pound, on a weighted average basis. The category of "Other costs" serves as a catch-all category, and organizations were allowed to use the category to capture all types of costs that can be reasonably allocated to CEW recovery activities. The instructions and training provided to approved collectors and recyclers specifically stated that the sub-categories listed under "other" are flexible, with the intent of reducing the

reporting burden while also encouraging reports that are as complete and accurate as possible. Some respondents chose to exclude several subcategories under "other," presumably because they were unable to estimate their costs for CEW handling.

For all of these reasons, the "other costs" category is the most variable. Table 3-3 provides a breakdown of recovery costs reported in the "other" category, including the percentage of reports that listed costs and the weighted average cents per pound for each subcategory. In terms of cents per pound, the most important subcategories were advertising, facilities and equipment rental/lease and "other additional costs."

With two-thirds of reports including advertising, it was one of the most commonly reported "other" costs, and is relatively well defined. The other two top "other" cost categories, however, are less defined and more variable. Some firms included costs in the "facilities and equipment rental/lease" and "other additional costs" subcategories related to site development and start-up that they stated would decrease in future years. In a couple of instances this subcategory was partly responsible for outlier costs that were extraordinarily high compared to other reported costs.

Table 3-3
Breakdown of Recovery "Other Costs"

Line Item	Number of Sample Reports Listing	Percent of Sample Reports That Included Data For Each Line Item	Weighted Average Cost (Cents per Pound)
Advertising	33	67%	1.8
Processing and Disposal	11	22%	<< 0.1
Supplies	39	80%	0.5
Depreciation	15	31%	0.1
Insurance	27	55%	0.4
Debt Service	6	12%	<< 0.1
Fuel	14	29%	0.1
Maintenance	20	41%	0.1
Property Taxes	12	24%	<< 0.1
Utilities	26	53%	0.3
Facilities and Equip Rent/Lease	23	47%	1.7
Security	5	10%	<< 0.1
Capital Costs[1]	*Excluded*	*Excluded*	*Excluded*
Other Additional Costs	18	37%	1.4
General Overhead	20	41%	0.8
Total	49	100%	7.3

1) Six organizations reported a total of $88,187 in capital costs which were excluded from the operating cost analysis.

3.4 Factors Influencing Collectors' Net Cost per Pound

A number of factors influence the recovery net cost per pound. Because the effect of each factor is difficult to separate from others, and also because of instability in operations during the program's first year of operation, data from this analysis of 2005 net cost reports may not provide quantitative conclusions on exactly how these factors influence costs. Additional data in future years will assist in better understanding how and why recovery costs vary. Nevertheless, the following sections describe each factor identified and aid in understanding how collection operations vary.

3.4.1 Amount of Revenue Received for Recovery Activities

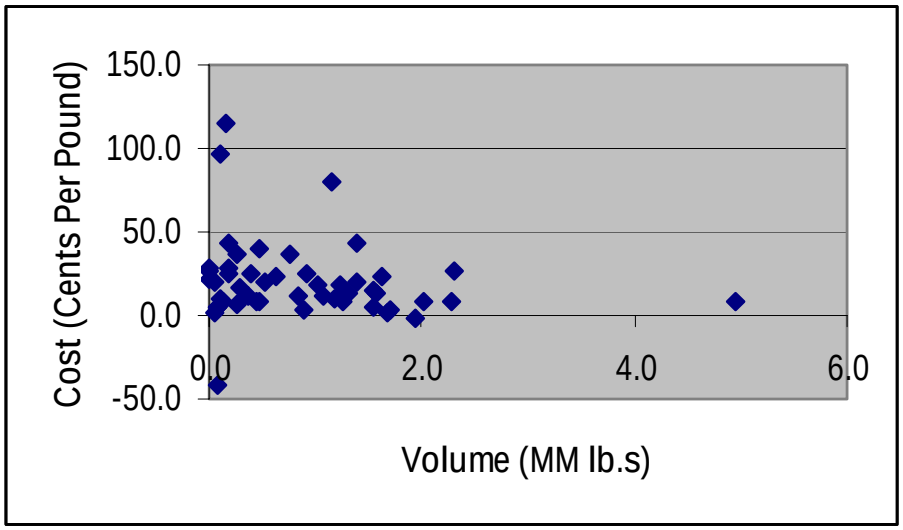
Recovery revenue, derived either through collection service fees or supplemental recycler payments, directly reduces net costs. As discussed in Section 3.2 above, 22 of the 49 reviewed reports showed recovery revenues, generally derived from service fees charged to generators. While many collectors have decreased or eliminated such fees, many continue to charge them, in both the public and private sectors. An unidentified portion of recovery revenue was also derived from payments from recyclers over-and-above the 20 cent standard payment, a trend which is apparently intensifying in recent months, with some recyclers reportedly paying up to 10 cents per pound beyond the standardized payment. Additionally, some generators are beginning to conduct auctions at which they seek the highest bidder to collect their CEW (and often, other electronics waste).

Regardless of the source, revenue directly reduces net costs. Based on the sample of reviewed and confirmed net cost reports, in 2005, the 22 recovery reports showing revenue had a weighted average net cost of 18.5 cents per pound, compared to 24.5 cents per pound for the remaining 27 recovery reports that did not show recovery revenue.

3.4.2 Volume

Higher-volume collectors tend to have lower costs, but instability during the program's first year made economy-of-scale benefits less predictable. It is reasonable to expect that, due to economies of scale, large collectors would have lower unit costs than small collectors. As illustrated in Figure 3-2, however, this relationship is not as clear as might be expected. While some low-volume collectors had very high costs, and some relatively large-volume collectors had relatively low costs, there are many reports that do not appear to follow this rule. One reason for this is probably the fact that in this first year of the program, many organizations reported that their cost structure had not yet stabilized, as they worked to reduce their costs and increase their efficiency. Another reason for some of the outliers is the high variability of revenue received by recovery organizations. For example, one low-volume organization reported a net cost per pound of -47.0 cents per pound. Review of this report confirmed that this was due to a relatively low cost structure combined with very high revenue resulting from unit generator fees of $25 to $35 per CEW collected. (This organization has since reduced, but not eliminated, these fees.)

Figure 3-2: Recovery Net Cost per Pound vs. Volume Handled



3.4.3 Type of Targeted Generator

Recovery programs targeting non-residential CEW generators appear to be significantly less costly than those targeting residential generators. As shown in Table 3-4, based on a limited sample, 42 percent of collection programs target residential generators and have a weighted average net cost of 22.8 cents per pound. In comparison, 37 percent of recovery programs target primarily non-residential generators, with a weighted average net cost per pound of 10.9 cents per pound.

Table 3-4
Recovery Cost Comparison by Targeted Generator Type

Type of Generator Targeted	Number of Sample Reports Analyzed	Percentage of Sample Reports Analyzed	Weighted Average Net Cost (Cents per Pound)
Residential	8	42%	22.8
Non-Residential	7	37%	10.9

1) Based on a limited sample of 19 reports that submitted a supplemental questionnaire.
2) Programs are defined based on their recovering at least 75% of their total volume from the indicated generator type.

3.4.4 Type of Recovery Program Used

The type of recovery program used influences the cost. However, other cost factors may be more influential, and tend to blur the importance of the program type employed. For example, a greater percentage of pick-up programs may be operated by private companies, as opposed to government agencies. As shown in Table 3-5 below, based on a limited sample of reporting organizations that completed a supplemental questionnaire, about one-fourth of collection programs use pick-up programs (e.g., pick-up by appointment, curbside, and commercial scheduled collection accounts) at a weighted average cost of 15.4 cents per pound. And, well over one-third of programs use a permanent drop-off facility to recovery CEW, with a weighted average cost of 17.6 cents per pound. One possible explanation for this is that pick-up programs may tend to be operated by private sector firms, while many

drop-off facilities are operated by government agencies that may provide a wide range of services, such as household hazardous waste, materials recycling, solid waste management and/or public education activities.

Table 3-5
Recovery Cost Comparison by Program Type

Type of Recovery Program[1]	Number of Sample Reports Analyzed[2]	Percentage of Sample Reports Analyzed	Weighted Average Net Cost (Cents per Pound)
Pick-Up Programs[3]	5	26%	15.4
Permanent Drop-Off Programs	7	37%	17.6

1) Programs are defined based on their recovering at least 75% of their total volume through the indicated program type.
2) Based on a limited sample of 19 reports that submitted a supplemental questionnaire.
3) Pick-up programs include pick-up from commercial and industrial clients (very common), as well as less common residential "curbside" pick-up programs for E-Waste.

3.4.5 Type of Organization

Private companies appear to have lower net costs than government programs, though additional data is required to confirm this. There is insufficient data to evaluate non-profit operations and other differences in organization type at this time. As shown in Table 3-6, private collectors had a weighted average net cost per pound of 12.4 cents, compared to government collectors with 52.6 cents per pound. This limited sample was influenced by two large California municipalities that reported relatively very high net costs, in large part due to contractor charges associated with running permanent drop-off facilities for household hazardous waste. These costs were allocated to CEW based on the percentage of weight handled allocated to CEW. Also, as shown in the table, other differences in cost were less significant and, due to the limited sample size, it may be premature to draw additional conclusions from the table.

Table 3-6
Net Cost of Collection By Type of Organization

Type of Organization	Number of Sample Reports Analyzed	Percentage of Sample Reports Analyzed	Mean Net Cost (Cents Per Pound)	Weighted Average Net Cost (Cents per Pound)
Private Company Collector	22	45%	17.8	12.4
Government Agency Collector	4	8%	35.2	52.6
Non-Profit Collector	3	6%	16.3	15.8
All Sampled Collectors (Private, Govt and Non-Profit)	29	59%	20.0	17.0
All Sampled Dual Entities (Recovery Activities Only)	20	41%	22.0	17.3
Total	**49**	**100%**	**20.8**	**17.1**

3.4.6 Management Practices

As with any business, management plays a key role in the overall operation, efficiency and profitability of recovery operations. Even firms with very similar size and business models may differ considerably in their costs and revenues, based on the experience, savvy and general business acumen of management.

While not quantitatively analyzed in this report, the management practices employed by organizations clearly are a major determinant of their costs. In several cases, organizations stated that they had already taken steps to reduce the relatively high costs reported in 2005, either by closing particular facilities, adjusting labor and operating procedures, or through a variety of other management practices. Included in this category is the trend toward mergers and acquisitions, and the management savvy of collectors in taking financial advantage of increasing competition by recyclers to secure business from collectors. Additionally, recovery organizations undertake a wide range of business activities in addition to CEW collection, including collection of other electronic waste, other waste or recyclables, hazardous waste management services, and asset management services. It is undetermined how these other business activities influence the cost of CEW recovery. However, many respondents noted that they are essentially obligated by customer demand to accept other electronic wastes beyond CEW, and that additional types of electronic waste should be incorporated into the CIWMB program in future years.

3.4.7 Changing Technologies and Design of Recovered CEW

This analysis of 2005 CEW recovery and recycling net costs is exclusively focused on CRT devices. As LCD, flat-screen and other technologies begin to increase numbers in the recycling stream; costs will surely be altered significantly. Analysis of this factor is beyond the scope of this study.

3.4.8 Rural Collection Activities

Collectors in rural areas face different conditions from those in more urban locations. These differing conditions may be reflected in lower volumes, higher transportation costs, different percentages of business versus residential services, lower labor and property costs and/or other differences. The impact of rural demographics on net cost and infrastructure needs warrants further analysis.

Section 4

ANALYSIS OF RECYCLING NET COST

4.1 Overview

This section summarizes the analysis of recycling revenues and costs. This overview focuses on net cost-per-pound estimates as reported in the study sample. The following two sections describe recycling revenue and costs, respectively, in more detail. The final sub-section explores the factors that most influence recycling net costs.

Figure 4-1 shows the reported net cost per pound for each of the 20 reviewed and confirmed reports for recycling activities included in the study sample, arranged from lowest to highest. As discussed in Section 2.1 above, this sample comprises 71 percent of all submitted dual entity reports (which include a section on both recovery and recycling). In all, 69 percent of all volume handled by CEW recyclers in California in 2005 is represented in the sample set of recycling reports analyzed.

Figure 4-1 Recycling Net Cost Estimates Included in the Study Sample
($ per Pound)

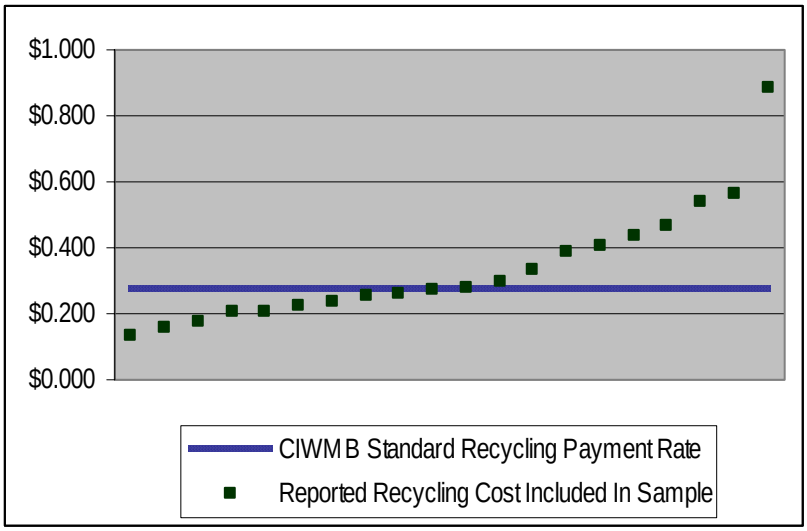


Table 4-1 summarizes analysis of these 20 reviewed and confirmed recycling net cost reports. As with the analysis of recovery costs in the previous section, the table lists four separate measures that each convey important information useful in understanding how net costs vary. The ***weighted average*** is a measure of overall program-wide performance that weighs each firm according to the total number of pounds they handle (e.g., larger firms influence the weighted average more than smaller firms). It is calculated by adding values from all submitted reports, and dividing the sum by the total number of pounds reported. The ***mean*** is the average of each firm's reported value, with all firms considered equally regardless of their size. The ***median*** is the reported value for which half of the sample is above and half is below. Finally, the "percentage of reports above standard payment rate" indicates the percentage of reports in the sample that showed a recovery net cost per pound greater than the current standard recovery payment rate of 20 cents per pound.

Table 4-1
Summary of Recycling Net Cost per Pound Estimates

	Item	Weighted Average	Mean	Median	Percentage Lower than Standard Payment Rate
Recycling	Revenue	5.7	5.5	5.1	NA
	Cost	30.9	39.1	31.8	NA
	Net Cost[2]	25.2	33.6	27.5	50%

1) Based on a sample of 20 reviewed and confirmed reports.
2) Net cost equals costs minus revenue. However, due to the nature of the statistics, this formula does not hold exactly for the median column.

4.1.1 Findings

The following findings are based on the analysis of the reports, the net costs of which are summarized in the figure and table above.

Finding: Recycling net costs vary widely across reporting organizations.

As with recovery net cost reports, some recycling organizations reported significantly different net costs per pound. There is one "outlier" with reported net cost substantially higher than most other organizations. Unlike CEW recovery entities, however, there were no recycler net cost reports in the study sample that would be considered outliers on the low side. Reasons for differences in reported costs include different management practices, throughput, differences in the nature of recycling processing activities undertaken, market revenue received, and costs of CEW supplies. In addition to these operational differences, some firms experienced relatively high costs due to one-time start-up costs associated with facilities and equipment purchases or modifications. Section 4.4 below discusses the factors that most influence variability of recycling net costs in more detail.

Finding: Estimates of "typical" net costs per pound for recycling vary from 25.2 to 33.6 cents per pound, depending on the measure considered.

Table 4-1 provides three separate measures of "typical" net cost per pound for recycling activities. The weighted average of 25.2 cents per pound reflects the overall, program cost, calculated as if the program operated as a single firm (i.e., by dividing the total reported costs by total pounds for all firms in the study sample). This measure weighs larger firms more than smaller ones. The mean of 33.6 cents per pound is an average of each firm's reported value. It is higher than the weighted average because a small number of firms reported relatively high values, driving up the overall mean. The median of 27.5 cents per pound is the mid-point – half of the study sample had a net cost per pound below this value, and half above.

Finding: Half of recyclers report a net cost per pound below the current standard payment rate.

Based on the study sample, 50 percent of recyclers reported a net cost per pound less than the current standard payment rate of 28 cents. Unlike recovery, economy-of-scale effects are more readily apparent for recyclers, with eight of the largest 10 recyclers reporting a net cost below the current standard payment rate, and six of the smallest seven recyclers report a net cost above the standard rate.

Finding: Proposals for a "reasonable rate of profit" for recycling activities vary.

As with recovery, program regulations allow participants to identify a "reasonable rate of profit or return on investment" in their net cost reports. (Section 186610.10) Profit was excluded from the analysis of net costs presented in this report. However, participants were asked to identify and suggest a "reasonable rate

of profit" for the Board's consideration when adjusting payment rates. Fourteen approved recyclers made suggestions that averaged to 11.7 cents per pound. For comparison, assuming average total revenues of 33.7 cents per pound (the sum of the 28 cent standard recovery payment and the weighted average recovery revenue of 5.7 cents per pound), a 20 percent profit rate equates to 8.4 cents, a 10 percent profit rate equates to 3.7 cents and a 5 percent profit rate equates to 1.8 cents per pound.

4.2 Recycling Revenue

As shown in Table 4-1, the weighted average recycling revenue reported was 5.7 cents per pound of CEW delivered to the recycling facility, with values varying from 0.9 to 15.4 cents per pound. The mean recycling revenue was 5.5 cents per pound and the median was 5.0 cents per pound. CEW recycling revenue is derived from the sale of recovered materials, including copper, ferrous metals, other wire and metals, mixed plastic, circuit boards and occasionally other materials. Additionally, five recyclers also reported other revenue. The nature of these revenue sources was not analyzed in this report.

4.3 Recycling Cost

Table 4-2 shows the breakdown of weighted average recovery costs into the three main categories of labor, transportation and other, based on the study sample. The following three sections describe each cost category in more detail.

Table 4-2
Breakdown of Weighted Average Recycling Costs

Measure	Labor	Transportation	Other	Total
Percent of Total Costs	40%	6%	54%	100%
Cents per Pound	12.2	2.0	16.7	30.9

4.3.1 Recycling Labor Costs

Labor costs comprised 40 percent of all recycling costs, at a weighted average of 12.2 cents per pound. About one-fourth of all reported labor costs were indirect labor.

4.3.2 Recycling Transportation Costs

Transportation costs comprised about 6 percent of all recycling costs, or 2.0 cents per pound on a weighted-average basis. All recyclers reported transportation costs for shipment of materials from their facility to markets. In addition, five recyclers (25 percent of the sample) also reported other transportation costs, comprising about 20 percent of the total transportation costs reported. Presumably, these other transportation costs relate to providing transportation services on behalf of collectors (a growing trend since 2005).

4.3.3 Recycling "Other" Costs

The "other cost" category comprised well over half of all recycling costs, or about 16.7 cents per pound on a weighted average basis. The category of "other costs" serves as a catch-all category, and organizations were allowed to use the category to capture all types of costs that can be reasonably allocated to CEW recovery activities. The instructions and training provided to approved collectors and recyclers specifically stated that the sub-categories listed under "other" are flexible, with the intent of reducing the reporting burden while also encouraging reports that are as complete and accurate as possible. Some respondents chose to exclude several subcategories under "other," presumably because they were unable to estimate their costs for CEW handling.

For all of these reasons, the "other costs" category is the most variable. Table 4-3 provides a breakdown of recycling costs reported in the "other" category, including the percentage of reports that listed costs and the weighted average cents per pound for each subcategory. In terms of cents per pound, the most significant subcategories were processing and disposal (for CRT glass), general overhead and "facilities and equipment rental/lease."

Table 4-3
Breakdown of "Other Costs" for Recycling Activities

Line Item	Number of Sample Reports Listing	Percent of Sample Reports That Included Data for Each Line Item	Weighted Average Cost (Cents per Pound)
Advertising	10	50%	0.4
Processing and Disposal	19	95%	3.8
Supplies	17	85%	1.1
Depreciation	11	55%	0.4
Insurance	15	75%	0.9
Debt Service	8	40%	0.2
Fuel	10	50%	0.1
Maintenance	14	70%	1.1
Property Taxes	2	10%	<< 0.1
Utilities	15	75%	0.5
Facilities and Equip Rent/Lease	17	85%	3.1
Security	1	5%	<< 0.1
Capital Costs	*Excluded*	*Excluded*	*Excluded*
Other Additional Costs	11	22%	1.7
General Overhead	11	22%	3.3
Total	**20**	**41%**	**16.7**

1) Three recyclers reported a total of $661,967 in capital costs which were excluded from the operating cost analysis.

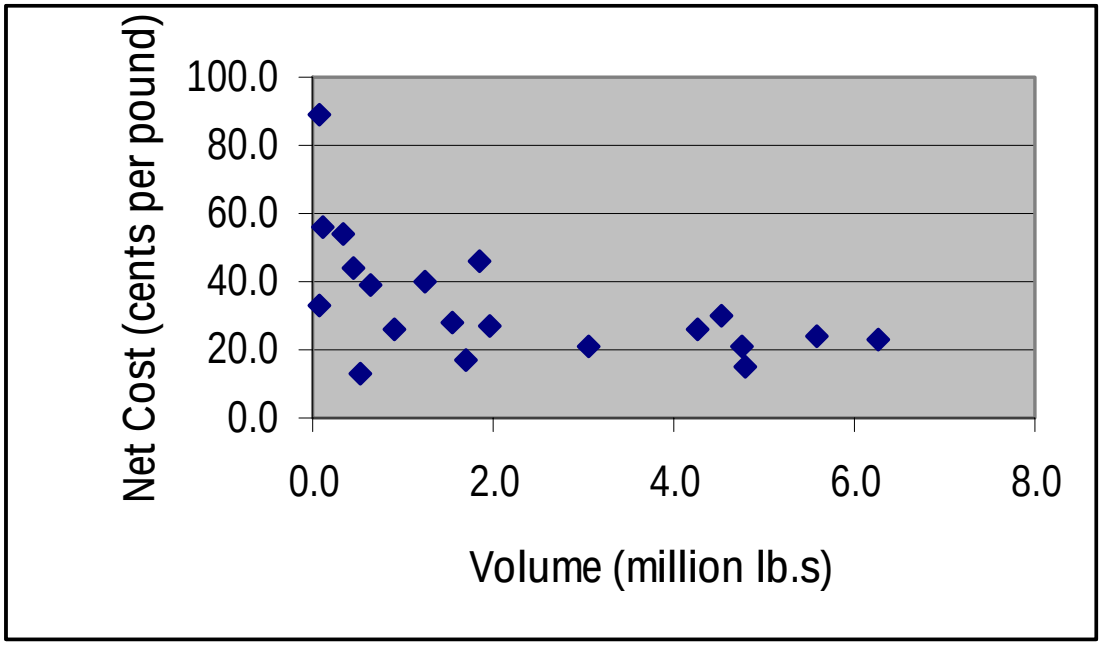
4.4 Factors Influencing Recyclers' Net Cost per Pound

As with recovery, a number of factors influence the recycling net cost per pound. Because the effect of each factor is difficult to separate from others, and also because of instability in operations during the program's first year of operation, data from the 2005 submittal may not be sufficient to explain the effect of each factor. As additional information becomes available, a more thorough and accurate analysis of cost influences can be prepared.

4.4.1 Volume

Higher volumes tend to result in lower per-unit recycling costs. As noted in Section 4.1 above, unlike recovery, economy-of-scale effects are more readily apparent for recyclers. As shown in Figure 4-2, eight of the largest 10 recyclers reported a net cost below the current standard payment rate, while six of the smallest seven recyclers reported a net cost above the standard rate.

Figure 4-2: Recycling Net Costs vs. Volume Handled



4.4.2 Competition for Supply and Increasing CEW Prices

Recyclers are increasingly competing for access to the limited supply of CEW, and this is resulting in increasing costs. In 2005, this trend was just emerging. Anecdotally, in 2005 some recyclers began to offer collectors a share of the recycling standard payment rate, over-and-above the standard recovery payment of 20 cents per pound which they were obligated to pass on. While in 2005 this trend was just beginning to emerge, with a relatively small number of supplementary payments on the order of 2 cents per pound, anecdotal evidence suggests this trend intensified in 2006, with some supplemental payments reaching as high as 10 cents per pound. Smaller recyclers have noted that larger recyclers are better able to absorb such costs, and that this price pressure is severely hampering their ability to thrive. The analysis of 2006 net cost reports, expected to be complete in spring 2007, will shed additional light on this trend.

4.4.3 Extent of Processing Activities and Market Value of Recovered Materials

The extent of processing activities undertaken by recyclers varies, and this has a direct influence on operating costs and the value of materials sold on the market. Some recyclers perform minimal processing, relative to processing CRT glass and shipping materials with minimal separation, typically in Gaylord boxes or similar containers. Other recyclers do additional processing, including further separation of components, for example, sorting plastic by type or color, shredding and automated separation. The analysis of 2006 net cost reports will include a detailed examination of market values and processing specifications.

4.4.4 Management Practices

As with any business, management plays a key role in the overall operation, efficiency and profitability of recycling operations. Even firms with very similar size and business models may differ considerably in their costs and revenues, based on the experience, saavy and general acumen of management.

As with CEW recovery operations, the management practices employed by organizations clearly are a major determinant of their costs. In several cases organizations stated that they had already taken steps to reduce the relatively high costs reported in 2005, either by closing particular facilities, adjusting labor and operating procedures, or through a variety of other management practices. Included in this category is the ability of firms to take advantage of mergers and acquisitions, negotiate favorable terms with suppliers and customers, and generally to thrive in a very competitive, and still unstable, emerging electronics recycling industry.

4.4.5 Type of Organization

The vast majority of recyclers are private companies, which appear to have lower costs than government agencies. Of the 28 recycling net cost reports provided to the research team by CIWMB, 22 are private firms, three are government agencies and three are non-profit organizations. However, of the 20 reviewed recycler reports included in the study sample, none are non-profits and only two are government agencies, providing an insufficient sample from which to draw statistically significant conclusions. However, for illustration purposes, the weighted average net cost for recycling reported by the 18 private firms in the sample was 24.7 cents per pound, compared to 47.2 cents per pound for the two government programs.

4.4.6 Changing Technologies and Design of Recovered CEW

The analysis of 2005 CEW recovery and recycling net costs is based largely on recovered CRT devices. As LCD, flat screen and other technologies begin to increase numbers in the recycling stream, costs will surely be altered significantly. Analysis of this factor is beyond the scope of this study.

4.4.7 Rural Recycling Activities

Recyclers in rural areas face different conditions from those in more rural locations. These differing conditions may be reflected in lower volumes, higher transportation costs, different percentages of business versus residential services, lower labor and property costs and/or other differences. The impact of rural demographics on net cost and infrastructure needs warrants further analysis.

Section 5
TRENDS AND CONSIDERATIONS

This section describes issues that the Board may choose to consider as it evaluates potential changes to the program, including potential adjustments to standard statewide recovery and recycling payment rates. Section 5.1 identifies several relevant market trends. Section 5.2 identifies alternative approaches to rate setting, and Section 5.3 identifies some of the potential implications of raising or lowering the standard payment rates.

5.1 Key Trends

The following trends related to the California electronics recycling industry were identified through discussion with Board staff, through the cost survey analysis and/or through interviews with collectors, recyclers and other stakeholders.

The California CEW recycling industry is growing steadily, in terms of the number of players and total volume handled.

Since its inception in January 2005, the number of approved collectors and recyclers, and the volume of CEW handled in the system have grown steadily. At the end of 2005 the program included just over 300 participants (approximately 30 of which were dual entities), and by January 2007 the number of participants had grown to well over 500, including some 50 dual entities. And, the volume of CEW recovered and recycled in the program grew from 65 million pounds in 2005 to over 124 million pounds in 2006. While the number of participants is likely to level off, new participants continue to enter the program at a steady rate, and volumes are continuing to rise. And, given uncertainty over the amount of so-called "legacy" waste, and the increasing promotion of the program by the Board and local agencies, the volume handled appears likely to continue growing at least through the next one to two years.

The California electronics recycling industry is still young and evolving rapidly; as a result, net costs may be somewhat erratic for the foreseeable future.

The onset of the California Electronics Recycling Act in January 2005 triggered rapid escalation of an already nascent industry in California. Since then, the industry has experienced rapid growth, with associated activities such as:

- Emergence of new firms and expansion of out-of-state firms into the California market place;
- Mergers and acquisitions intended to grow market share and improve market positioning;
- Experimentation with various recovery and recycling operational techniques, contracting and transactional terms.

These trends result in a variety of one-time costs and as yet un-stabilized operational structures that mean cost structures may not "settle down" to stable levels for some time.

Intense competition among recyclers is driving up prices paid to collectors.

This trend that began modestly in 2005 has intensified, based on discussions with recyclers and collectors. Recyclers are reportedly passing on an increasing share of their standard recycling rate payment to collectors, in an effort to secure market share. While in 2005 this practice was just beginning, with

typical pass-through amounts in the 2 to 3 cent-per-pound range, by early 2007 reports of pass-through amounts as high as 10 cents per pound have been documented. Collectors, in turn, are increasingly negotiating for more favorable terms, and/or adopting innovative sales approaches like auctions in order to secure the most favorable deal. This trend may further exacerbate the trend toward mergers and acquisitions, and/or the failure of smaller and less efficient recyclers.

Some collectors are also beginning to pass through a portion of their standard payment to providers of CEW devices.

This is a newly emerging trend that is also a by-product of intense industry competition. Auctions of CEW, along with other types of electronics devices, are increasingly common. And, some collectors are paying other individuals and firms that provide CEW (with appropriate source documentation). This is especially true of corporate-generated CEW.

Many collectors and recyclers feel compelled by market competition and customer demand to handle other types of electronics waste, in addition to CEW.

There is strong evidence that the state program for covered electronic waste is also spurring recovery and recycling of a wide range of other electronic waste. Many collectors state that they must provide such services or face loss of their customer base. Several suggested that the state should include the overall cost of service for all electronics waste covered, since these materials are, in essence, part and parcel of the services provided, and collectors and processors assert that some non-CEW electronics also pose potential environmental and health hazards if managed improperly at the end of their useful life. This analysis did not consider the costs and revenues associated with electronics waste other than CEW.

Market demand and prices for recovered CEW components were relatively strong during the first two years of the program, but may become more volatile in coming years.

Market prices for recovered components such as copper, aluminum, ferrous metals, plastic and circuit boards have been relatively strong, according to recyclers. And prices for "disposing" of CRT glass have remained steady, with sufficient demand for everything collected, especially via offshore markets. However, some recyclers noted that prices have begun to decline slightly from the relative peak prices in 2005. There also continues to be concern over the future of glass markets. Markets for materials recovered from CEW will be analyzed in detail in the report covering 2006 net cost reports, expected to be complete by June 2007.

Changing technologies for monitors and televisions will ultimately alter the economics of electronics recycling, but the effects of this trend have yet to appreciably affect recovery and recycling of CEW.

Few collectors and recyclers appear to be focusing on the inevitable shift from CRT technologies to LCD and flat screen products at this time. This shift will surely impact costs and operations at fundamental levels. For at least the next one to two years, it appears likely that the CEW stream will continue to be dominated by CRT devices.

5.2 Alternative Approaches to Rate Setting

Every two years beginning on July 1, 2004, State statute requires the Board, in collaboration with the Department of Toxic Substances Control, to establish a payment schedule "to cover the net cost for an authorized collector to operate a free and convenient system for collecting, consolidating and transporting

covered electronic wastes in the state," and to "cover a recycler's net cost to receive, process and recycle a covered electronic device from an authorized collector."[†]

Because costs vary considerably for program participants due to a number of factors (as documented throughout this report), the Board is faced with a dilemma. No matter where the Board sets the payment rate, some organizations costs will be more than covered, and some will be less than covered.

The issues below indicate some different approaches the Board may choose to adopt to address this dilemma when considering potential program adjustments to the standard statewide payment rates:

What measure should be used to set payment rates?

As discussed in Sections 3 and 4, there are several different measures derived from reported net costs that differ in subtle but important ways, for example:

- The ***weighted average*** is the overall program average, calculated by treating the program as if it were a single firm. It is calculated by dividing the total costs reported by all participating organizations by the total number of pounds of CEW handled. This measure is influenced most by the values reported by larger firms, with less weight given to smaller firms.
- The ***mean*** is calculated by averaging the reported net costs by each firm. It gives equal weight to each reported value, regardless of pounds handled or other factors. The mean can be influenced by a small number of "outliers" with very high or very low values.
- The ***median*** is the mid-point of reported values – half of all reports are below and half above the median. In contrast to the mean, it is not influenced by "outliers."
- The ***covered percentage*** is the percentage of all participants whose costs fall below a given payment level (and therefore whose costs are covered by the payment rate).

Since only some collectors receive service-related fees for CEW, and since statute references "free and convenient" collection services, how should recovery revenue be considered when setting rates?

For example, the Board could choose to exclude from the analysis consideration of fees charged for CEW by drop-off programs, and or the share of private service fees charged to commercial/industrial clients that this study allocated to CEW recovery.

Should the Board adjust recycling payment rates, collector payment rates or both?

The Board originally set the collector's standard payment rate based on estimates of the typical cost to collect CEW and to transport it to a recycler's facility. The recycling payment rate was set based on typical net costs for processing and shipment of recovered materials to market, minus market values for the materials.

Since the original rates were set, the market has changed significantly. Recyclers now almost always cover transportation costs, and as noted above, they are increasingly passing on a portion of their recycling payments to collectors, in an effort to successfully compete for access to CEW and market share. The strategy of passing funds through recyclers, in this light, appears to be successful in spurring innovation and increased recovery of CEW.

[†] California Public Resources Code, Section 42478-42479.

Should the Board establish tiered payment rates for different types of collection and/or recycling operations?

As discussed in Sections 4 and 5, different types of organizations have significantly different price structures, especially for recovery activities. For example, the costs of recovering large quantities of CEW from institutional generators in truckload amounts is far less than the cost of recovering CEW from residents through permanent household hazardous waste drop-off facilities operated by local government agencies or their contractors, on a per-pound basis. While the administrative burden would increase substantially, the Board could choose to set different payment rates for different types of collection and/or recycling operations.

5.3 Potential Implications of Increasing or Decreasing Rates

The implications of adjusting payment rates include:

- Increasing rates may tend to decrease the incentive for achieving greater efficiency. Program participants who receive payments in excess of profit levels they view as acceptable may choose to pass through an increasing portion of state funds to suppliers, and/or allocate a high percentage of the firm management's time and resources, to gain market share, while making increasing efficiency levels a secondary priority.
- Greater payments may further promote expansion of the number of firms involved in the program and the volume handled, along with associated competitive pressures. Decreasing program payments could have the opposite impact, with volumes potentially decreasing.
- The increased volume combined with increased payment rates could potentially compromise the solvency of the fund. Conversely, reduced payment rates will help to safeguard fund solvency.
- Increasing payment rates means more program participants will have their costs covered, whereas decreasing payment rates means fewer will.
- Increasing payment rates means the gap by which program payments exceed actual costs will increase, whereas decreasing payment rates will have the opposite effect.
- Increasing payment rates may exacerbate the trend toward recyclers and collectors passing through a portion of their standard payments, whereas decreasing rates may reduce this trend.

Appendix A
2005 NET COST REPORTING FORMS

Following are copies of the three standardized reporting forms provided by CIWMB and used to submit the 2005 Net Cost reports analyzed in this report. The forms include:

- The Net Cost Report (Form 220);
- The Recovery Revenue and Cost Worksheet (Form 220a); and
- The Recycling Revenue and Cost Worksheet (Form 220b).

CEW NET COST REPORT (FORM 220)

Important: Review the Guide to Net Cost Reporting in full prior to completing. Attach Net Cost Estimation Worksheets (Forms 220a for collectors and 220b for recyclers).

Line	Contact Information	
1	Organization Name	
2	CEW ID Number	
3	Type of Entity (Collector, Recycler, or Dual Entity)	
4	Mailing Address (Street, City, State, Zip)	
5	Contact Person for Net Cost Report	
6	Title	
7	Phone Number for Contact Person	
8	Email Address for Contact Person	
9	Fax Number for Contact Person	
10	Date of Report Preparation	
11	Reporting Period	

	Net Cost Summary			
	Important: *Use the* ***Net Cost Estimation Worksheet*** *(Form 220a for collection and Form 220b for recycling) to determine the correct revenue and cost estimates to list. Carefully read the line-by-line instructions in the* ***Guide to Net Cost Reporting.***	**Collection of CEW**	**Recycling of CEW**	**Total: Combined Collection and Recycling of CEW = A + B**
		Collectors and Dual Entities Complete	Recyclers and Dual Entities Complete	Dual Entities Complete
		A	B	C
12	Total Revenues for CEW Collection and/or Recycling *Include only revenues in relation to CEW collection or recycling, excluding payments from CIWMB made pursuant to the CA Electronics Recycling Act. See Instructions.*			
13	Total Costs for CEW Collection or Recycling *Include only costs in relation to CEW collection or recycling, excluding required payments (20 cents per pound) to approved collectors, made pursuant to the CA Electronic Waste Recycling Act. See Instructions.*			
14	Net Costs (Line 13 - Line 12)			
15	Total Pounds of CEW Collected and/or Recycled			
16	Average Net Cost per Pound (Line 14/Line 15)			

	Signed Declaration	
17	Printed Name of Person with Signature Authority for Net Cost Reports as Designated Pursuant to Section 18660.11.	
18	Title	
19	Signature *I hereby declare under penalty of perjury that this net cost report, including any and all figures, calculations and accompanying documents has been examined by me and is true, correct and complete.*	
20	Date Signed	
21	City and State Signed	

NET COST ESTIMATION WORKSHEET (FORM 220a)

PART A: RECOVERY OF CEW (Collectors and Dual Entities Complete)

Organization Name:	
CEW ID Number:	
Reporting Year:	
Date of Preparation:	

		Important: Review line-byline instructions in the Guide to Net Cost Reporting in full prior to completing. List costs and revenues in Column A if they are readily identifiable for CEW recovery. List CEW costs and revenues in column B if they are estimated due to the fact that other types of business or non-CEW products are also collected. Be sure to indicate methodology for this estimation in column C.	Itemized Revenue or Costs Specifically Dedicated to CEW Recovery A	Estimated Share of Business Revenue or Costs Allocated to CEW Recovery B	Explanation for Column B (Identify basis for allocation - See Instructions) C
		REVENUE FROM RECOVERING CEW			
1		Revenue from recyclers over and above the standard payment of 20 cents per pound required by the Act			
2		Revenue received for collection services, such as fees charged to CEW generators			
3		Other Allowable Revenues			
4		Total Revenue for CEW Recovery (Add lines 1 through 3)			
		COSTS OF RECOVERING CEW			
		Labor Costs			
5		Direct Labor			
6		Indirect Labor Allocated to CEW Handling			
7		Subtotal, Labor Costs (Add lines 5 and 6)			
		Transportation Costs			
8		Transportation Related to Recovery of CEW from Generators			
9		Transportation from Collector Facility to Recycler Facility			
10		Subtotal, Transportation Costs (Add lines 8 through 10)			
		Other Costs			
11		Advertising, Marketing, Promotion and Public Education			
12		Processing and Disposal			
13		Supplies			
14		Depreciation (excluding transportation-related)			
15		Insurance (excluding transportation related)			
16		Debt Service including interest (excluding transporation-related)			
17		Maintenance (excluding transportation-related)			
18		Fuel (excluding transportation-related)			
19		Property Taxes			
20		Utilities			
21		Facilities and Equipment Rent or Lease			
22		Security			
23		Capital Costs			
24		Other Costs:			
25		General Overhead			
26		**Subtotal, Other Costs (Add lines 11 through 25)**			
27		**TOTAL COSTS FOR CEW RECOVERY (Add lines 7A,7B 10A, 10B, 26A and 26B)**			

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Reasonable Profit					
28	For the purposes of adjusting the statewide standard payment rate, what do you consider to be a "reasonable rate of profit" for private collection operations? (List in cents per pound or, if you choose, use another basis. See instructions.)		Cents per Pound		Other Basis (Identify and explain in line 29)
Additional Notes and Explanations					
29	Add any additional explanation to clarify the methods you used to estimate revenues and costs. Cite line numbers where possible. (See instructions.)				
30	Identify any unique costs associated with your operation during the reporting year that are likely to change in future years. Attach additional sheets as needed. (For example, one-time start-up costs or the value of volunteer labor. See instructions.)				

NET COST ESTIMATION WORKSHEET (FORM 220b)

PART B: CEW RECYCLING (Recyclers and Dual Entities Complete)

Organization Name:	
CEW ID Number:	
Reporting Year:	
Date of Preparation:	

		Important: *Review line-byline instructions in the Guide to Net Cost Reporting in full prior to completing. List costs and revenues in column B if they are readily identifiable for CEW. List CEW costs and revenues in column B if they are estimated due to the fact that other types of business or non-CEW products are also recovered. Be sure to indicate methodology for this estimation in column C.*	Itemized Revenue or Costs Specifically Dedicated to CEW Recycling	Estimated Share of Business Revenue or Costs Allocated to CEW Recovery	Explanation for Column B (Identify basis for allocation - See Instructions)
			A	B	C
	REVENUE FROM RECYCLING CEW				
1	Revenue From Sale of Recycled CEW Components				
2	Other Allowable Revenues				
3					
4	Total Revenue for CEW Recycling (Add lines 1 through 3)				
	COSTS OF RECYCLING CEW				
	Labor				
5	Direct Labor				
6	Indirect Labor Allocated to CEW Handling				
7	Subtotal, Labor Costs (Add lines 5 and 6)				
	Transportation Costs				
8	Transportation from Recycling Facility to Market/Disposal Facility				
9	Other Allowable Transportation				
10	Subtotal, Transportation Costs (Add lines 8 through 10)				
	Other Costs				
11	Advertising, Marketing, Promotion and Public Education				
12	Processing and Disposal				
13	Supplies				
14	Depreciation (excluding transportation-related)				
15	Insurance (excluding transportation-related)				
16	Debt Service (including interest (excluding transporation-related)				
17	Fuel (excluding transportation-related)				
18	Maintenance (excluding transportation-related)				
19	Property Taxes				
20	Utilities				
21	Facilities and Equipment Rent or Lease				
22	Security				
23	Capital costs				
24	Other Costs:				
25	General Overhead				
26	**Subtotal, Other Costs (Add lines 11 through 25)**				
27	**TOTAL COSTS FOR CEW RECYCLING (Add lines 7A, 7B, 10A, 10B, 26A and 26B.)**				

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Reasonable Profit					
28	For the purposes of adjusting the statewide standard payment rate, what do you consider to be a "reasonable rate of profit" for private recycling operations? (List in cents per pound or, if you choose, use another basis. See instructions.)		Cents per Pound		Other Basis (identify and explain in line 29.)
Additional Notes and Explanations					
29	Add any additional explanation to clarify the methods you used to estimate revenues and costs. Cite line numbers where possible. (Attach additional sheets as needed. See instructions.)				
30	Identify any unique costs associated with your operation during the reporting year that are likely to change in future years. (For example, one-time start-up costs or the value of volunteer labor) Attach additional sheets as needed. See instructions.				

Appendix B
OPTIONS FOR IMPROVING FUTURE NET COST ANALYSES

Following are several potential options for improving future net cost reporting and analyses that were identified during this study.

1. Refine the reporting forms and guide and the current analyses techniques.

The reporting forms and guide have been adjusted for the 2006 reporting year to increase the ease of use and analysis, and to clarify certain reporting items. Two training sessions were held which drew approximately 130 participants, and a recorded videoconference training session has been made available on the Board's web site, along with the forms and the guide. Furthermore, procedures for the 2006 analysis are being greatly refined based on the first year experience. Should the Board continue to require self report as a basis for annual net cost analyses, the reporting process and analysis procedures can continue to be refined.

2. Focus more exclusively on the data required to support the Board's chosen rationale for rate setting.

If the Board made a policy decision to focus on a particular measure or criteria for adjusting rates, the cost reporting and analysis procedures could be tailored to more efficiently provide the information needed. The Board could choose to focus, for example, on any one of the four measures described in Sections 3.1 (for recovery) or 4.1 (for recycling), or could choose criteria related to the percentage of firms whose net costs are covered by the CIWMB payment, the percentage of pounds of CEW handled that is cost covered, fund solvency, or other criteria.

3. Incorporate independent on-site review or audits of report supporting documentation.

This year's analysis included review and confirmation of a sample of reports via telephone, fax and email correspondence. The analysis could be expanded to include greater review of supporting documentation on-site. This would serve the purpose of both enhancing the verification process and also providing a further incentive for accuracy in submitted reports. On the other hand, on-site verification would also significantly increase the cost of the analysis to both the Board and respondents. Such on-site reviews could entail a thorough, but informal verification process, or could comprise a formal audit, potentially combined with consideration of other program accounting and documentation functions.

4. Incorporate independent time-in-motion studies.

The Board could adopt an approach to net cost estimation similar to that used by the California Department of Conservation, Division of Recycling (the Division) in implementing the state's beverage container redemption program. Rather than requiring self reporting of revenues and costs, the Division selects a study sample of organizations and conducts detailed, independent

studies on site, including detailed review of accounting documentation and time-in-motion studies to help accurately allocate labor and other costs. Such studies would significantly increase the cost of the cost analysis exercise, while decrease the burden on collectors and recyclers who are not selected for inclusion in the study sample.

5. Prepare independently derived cost targets for archetypal model programs.

Rather than focusing the analysis on characterizing average or typical programs, the Board could focus on a small number of archetypal model programs and build reasonable cost targets for each, based on actual operating data from a sample of programs. For example, net costs for different types of collection programs such as permanent drop-off facilities, commercial pick-up programs and special events could be developed. While such a tiered system could help to ensure that payments are expended as efficiently as possible, the costs of administering such a tiered system would be significantly higher than the current system.

6. Expand the analysis of costs for non-CRT covered electronic waste.

Many program participants have commented that they feel compelled to provide broader electronics recycling services than just CEW, due to customer demand and competitive pressures. Some suggested that a broader range of electronic waste should be considered when setting payment rates so that the CIWMB standard payment rates would cover the net cost of recovering and recycling E-waste beyond CEW. Future cost reporting and analyses could seek to capture additional information on a broader range of electronic waste recycling activities. If all electronic waste were covered, this would likely result in more accurate reporting, as collectors and recyclers would not have to estimate the portion of electronic waste that is "covered."

7. Analyze how changes in technologies will impact CEW recovery and recycling in coming years.

Given rapid changes in sales of new consumer electronic products using new technologies such as LCD and flat screen panels, it is generally accepted that the composition of the stream of recovered CEW will change significantly in coming years. However, beyond anecdotal projections, there appears to be a dearth of reliable information to help the Board and program participants to plan, or to project how the shift in technologies may impact the economics, technological and market functioning of the program. The Board could analyze new technology trends to identify potential barriers and opportunities to ensure a successful program well into the future.